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**Implementation of a Transportation Cost Apportionment System
for the City of Port Elizabeth, South Africa**

by

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Summary

IMPLEMENTATION OF A TRANSPORTATION COST APPORTIONMENT SYSTEM FOR THE CITY OF PORT ELIZABETH, SOUTH AFRICA

Any new development must be adequately served by road infrastructure. Public authorities are often financially unable to construct new road infrastructure or to upgrade the existing roads that might be required by new developments. Since the provision of transport infrastructure will benefit the public in general, it is unreasonable to expect a property developer to bear the full costs. There must be an apportionment of responsibility, and therefore cost of the construction of infrastructure between the individual developers and the public who will directly benefit from the availability of such infrastructure. Studies of cost apportionment procedures used in developed countries were carried out as part of a National Demonstration project and through the elimination of practical problems a procedure for use in South Africa was proposed.

The objective of a cost apportionment system is to develop, implement and manage an equitable system through which the transportation costs associated with land use changes are apportioned between an authority and the private sector in an affordable manner, to ensure the sustained development of a City through timeous improvements to the road network and associated transport infrastructure.

This paper elaborates on the need for cost apportionment systems and outlines the principles and procedures involved in their implementation. The use of an Emme/2 model in setting up a transportation cost apportionment system, an overview of the problems experienced in the implementation of a cost apportionment system for the City of Port Elizabeth and possible solutions to the problems are also provided.

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ANNEXURE A
Formulae used in the calculations of Contributions

CALCULATION OF BULK CONTRIBUTION

Definition of Symbols

The following symbols are defined to illustrate the mathematical calculation of the developer's bulk contribution:

- i. **Na** = Total number of vehicles that can use an element of the road network daily for access, i.e. maximum daily capacity (approximately 10 X peak capacity).
- ii. **Nc** = Total number of vehicles that can use an element of the road network during the peak hour, i.e. maximum peak capacity.
- iii. **Nd** = Actual number of vehicles travelling on an element daily.
- iv. **Np** = Actual number of vehicles travelling on an element during the peak hour.
- v. **Ca** = Access cost (as described earlier) of an element of the road network.
- vi. **Cc** = Capacity cost of an element of the road network.
- vii. **Vd** = Number of vehicle trips generated by a specific development on an element of the road network daily.
- viii. **Vp** = Number of vehicle trips generated by a specific development on an element of the road network during the peak hour.
- ix. **Ntd** = Number of daily vehicles classified as through traffic on an element of the road network.
- x. **Ntp** = Number of peak hour vehicles classified as through traffic on an element of the road network.

Using the above, the following costs and rates can be determined:

i. Total rate (Rands) per vehicle per element

Access:

$$R_{ta} = C_a / N_d \text{ [R/vehicle]}$$

Capacity:

$$R_{tc} = C_c / N_c \text{ [R/vehicle]}$$

ii. Value of Grants from outside sources of a network element

The value of an external grant is allocated to the access and capacity costs of an element in proportion to the capacity used by daily traffic and peak hour traffic.

Access:

$$G_a = (\text{Total Grant for element}) \times \frac{(N_d/N_a)}{(N_d/N_a) + (N_p/N_c)}$$

Capacity:

$$G_c = (\text{Total Grant for element}) \times \frac{(N_p/N_c)}{(N_d/N_a) + (N_p/N_c)}$$

iii. Value of Spare Capacity on a network element

The Rand value of the spare capacity is equal to the product of the proportion of unused capacity during the peak period and the cost of the capacity network of the element.

$$S_c = [1 - (N_p/N_c)] \times C_c$$

iv. Value of a network element that should be paid by through traffic

This amount includes grants from external sources.

Access:

$$T_a = C_a \times (N_{td}/N_a)$$

Capacity:

$$T_c = C_c \times (N_{tp}/N_c)$$

v. Developer's Bulk Contribution for an element of the road network

Access:

$$D_a = R_{ta} \times V_d$$

Capacity:

$$D_c = R_{tc} \times V_p$$

The sum of all the developer's costs of all the network elements, $(D_a + D_c)$, is equal to the total contribution that should be made by a developer.

ANNEXURE B
Typical Examples of Transportation Development Levies

PORT ELIZABETH		Transportation Development Levy	
Description:			Date: 01-Jul-98
Location:	Walmer, Erf xxxx		
Land use:	Rezoning from Res 1 to Bus 1		
Erf Size and FSI:	1400m ² , 0,4		
Traffic Input Data:	Development Zone No.		243
	Peak Trip Generation		140
	Daily Trip Generation		790
	Factor daily traffic:peak traffic		10
Summary:			
Total network upgrading costs at current construction costs:			
	Capacity		R33 110 000
	Access		R16 700 000
	Total		R49 810 000
Developer's contribution:		Per Vehicle	Total
	Capacity	R409	R57 327
	Access	R57	R44 888
	Transportation Development Levy		R102 215

Instructions for use:

- Enter the following information in the blue cells only:
1. Date of application.
 2. Description of development.
 3. Zone number where development is located.
 4. Number of peak period trips based on results of traffic impact study.
 5. Number of daily trips based on results of traffic impact study.
 6. Escalation factor.
 7. Percentage discount on contributions.
 8. To print click on print icon above (4th icon from the left).

BASE INPUT DATA:	
Base date costs:	30-Jun-97
Date of rezoning	01-Jul-98
Escalation % per annum	10%
Ecalation factor:	1.1055
Percentage discount	0%

PORT ELIZABETH		Transportation Development Levy	
Description:			Date: 01-Jul-98
Location:	Walmer, Erf xxxx		
Land use:	Rezoning from Res 1 to Bus 1		
Erf Size and FSI:	1400m ² , 0,4		
Traffic Input Data:	Development Zone No.		243
	Peak Trip Generation		14
	Daily Trip Generation		79
	Factor daily traffic:peak traffic		10
Summary:			
Total network upgrading costs at current construction costs:			
	Capacity		R33 110 000
	Access		R16 700 000
	Total		R49 810 000
Developer's contribution:		Per Vehicle	Total
	Capacity	R409	R5 733
	Access	R57	R4 489
	Transportation Development Levy		R10 222

Instructions for use:

- Enter the following information in the blue cells only:
1. Date of application.
 2. Description of development.
 3. Zone number where development is located.
 4. Number of peak period trips based on results of traffic impact study.
 5. Number of daily trips based on results of traffic impact study.
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Percentage discount	0%

ANNEXURE C
Extract from Microsoft Excel Spreadsheet

Converted No.	Actual zone no	Sprdsht no	Link No	Select links	Capacity Cost (mill)	Access Cost (mill)	Total cost (R mill)	Description	% capacity	% access	Peak Traffic	Daily Traffic	Peak Capacity	Contribution Capacity	Contribution Access	ZONES			
																1	2	3	4
122	10	1	1	20073164	R0.00	R0.00	R0.0	Strandfontein Road Ext	0	0	291	2910	3600	R0	R0	#VALUE!	0.002	0.006	0.006
	11	2	2	20183089	R0.00	R0.80	R2.0	Driftsands Drive Ext.	0	40	1224	12240	3600	R0	R27	#VALUE!	0.014	0.020	0.021
	12	3	3	23312332	R3.24	R0.36	R3.6	Cape Road (Langhjn - Mnt)	90	10	2038	20380	10800	R106	R35	#VALUE!	0.096	0.079	0.078
	13	4	4	23362749	R0.84	R0.56	R1.4	3rd Avenue (south)	60	40	967	9670	3600	R3	R5	#VALUE!	0.006	0.001	0.002
	14	5	5	23363161	R0.30	R0.20	R0.5	3rd Avenue (north)	60	40	618	6180	3600	R6	R13	#VALUE!	0.007	0.013	0.012
	20	6	6	23512352	R2.32	R0.58	R2.9	Cape Road Widening	80	20	1064	10640	10800	R26	R37	#VALUE!	0.012	0.020	0.003
	21	7	7	23713089	R0.00	R1.40	R3.5	Humewood/Driftsands int	0	40	1129	11290	7200	R0	R7	#VALUE!	0.014	0.002	0.021
	22	8	8	24052406	R1.89	R0.21	R2.1	Commercial Road over N2	90	10	2838	28380	3600	R95	R8	#VALUE!	0.022	0.006	0.010
	23	9	9	24142622	R0.27	R0.03	R0.3	TR15/Spondo Street Int	90	10	684	6840	7200	R1	R0	#VALUE!	0.001	0.003	0.003
	30	10	10	24322581	R0.00	R0.00	R0.0	Chase Drive Ext	0	0	1002	10020	3600	R0	R0	#VALUE!	0.000	0.000	0.000
	31	11	11	24392837	R0.00	R0.00	R0.0	Dual Standford Rd - Missn Art	0	0	1200	12000	7200	R0	R0	#VALUE!	0.012	0.000	0.001
	32	12	12	24512452	R1.44	R0.36	R1.8	Target Kloof Widening	80	20	1690	16900	7200	R907	R545	#VALUE!	0.021	0.000	0.001
	40	13	13	24522453	R0.00	R0.00	R0.0	Target Kloof Safety Barriers	0	0	2398	23980	7200	R0	R0	#VALUE!	0.122	0.043	0.044
	41	14	14	24532454	R0.00	R0.00	R0.0	River Road (west)	0	0	1423	14230	3600	R0	R0	#VALUE!	0.075	0.025	0.028
	42	15	15	24592460	R0.00	R0.00	R0.0	William Moffat Expressway (centre)	0	0	2875	28750	7200	R0	R0	#VALUE!	0.013	0.000	0.002
	43	16	16	24632528	R0.00	R0.00	R0.0	Kragga Kamma Road	691	691	6910	6910	3600	R0	R0	#VALUE!	0.009	0.001	0.002
	50	17	17	24683009	R8.40	R3.60	R12.0	Heugh Road Upgrade	70	30	2189	21890	7200	R3 393	R2 699	#VALUE!	0.007	0.010	0.014
	51	18	18	24732472	R0.00	R0.00	R0.0	Buffelsfontein Road	0	0	1975	19750	7200	R0	R0	#VALUE!	0.038	0.003	0.007
	52	19	19	24742520	R0.00	R0.00	R0.0	William Moffat Expressway (south)	0	0	1231	12310	7200	R0	R0	#VALUE!	0.012	0.000	0.001
	53	20	20	24882908	R0.42	R0.18	R0.6	Old Grahamstown Road	70	30	1135	11350	7200	R3	R4	#VALUE!	0.006	0.000	0.001
	54	21	21	24942603	R0.00	R0.00	R0.0	MR 460	273	273	2730	2730	7200	R0	R0	#VALUE!	0.003	0.000	0.000
	60	22	22	25042505	R0.00	R0.00	R0.0	Kempston Road	1953	1953	19530	19530	7200	R0	R0	#VALUE!	0.001	0.001	0.000
	61	23	23	25082511	R0.00	R0.00	R0.0	Burt Drive Widening	0	0	1182	11820	7200	R0	R0	#VALUE!	0.010	0.000	0.001
	62	24	24	25163169	R0.00	R0.00	R0.0	N2 Cotswoid Interchange	0	0	3066	30660	7200	R0	R0	#VALUE!	0.041	0.003	0.006
	63	25	25	25182519	R1.00	R1.00	R2.0	William Moffat (4 x int)	50	50	2723	27230	7200	R154	R230	#VALUE!	0.009	0.000	0.001
	70	26	26	25702586	R0.00	R0.00	R0.0	Mendi Road Upgrading	0	0	602	6020	3600	R0	R0	#VALUE!	0.011	0.002	0.003
	71	27	27	25743061	R0.00	R0.00	R0.0	Forest Hill Drive Ext	0	0	1330	13300	7200	R0	R0	#VALUE!	0.018	0.010	0.012
	72	28	28	26012602	R0.00	R0.00	R0.0	Main Road (Georges Strand)	588	588	5880	5880	7200	R0	R0	#VALUE!	0.007	0.001	0.001
	73	29	29	26032602	R0.00	R0.00	R0.0	MR 450 (west)	389	389	3890	3890	7200	R0	R0	#VALUE!	0.003	0.000	0.000
	74	30	30	26062612	R0.00	R0.00	R0.0	Njoli Street Upgrading	0	0	695	6950	3600	R0	R0	#VALUE!	0.009	0.001	0.002
	80	31	31	26272628	R0.00	R0.00	R0.0	TR 63 (MR449 - Mission Arterial)	0	0	682	6820	3600	R0	R0	#VALUE!	0.011	0.000	0.001
	81	32	32	26293042	R0.00	R0.00	R0.0	MR 448 (east)	0	0	893	8930	3600	R0	R0	#VALUE!	0.005	0.000	0.001
	82	33	33	27202726	R0.20	R0.00	R0.4	Kabega Road Improvement	50	0	1001	10010	3600	R3	R0	#VALUE!	0.010	0.001	0.002
	83	34	34	27412744	R0.48	R0.32	R0.8	Norvic Drive Ext (West)	60	40	713	7130	3600	R1	R1	#VALUE!	0.031	0.002	0.004
	84	35	35	27452533	R0.36	R0.84	R1.2	Norvic Drive Ext (east)	30	70	906	9060	3600	R1	R5	#VALUE!	0.035	0.002	0.004
	85	36	36	27483029	R0.24	R0.36	R0.6	Hurd Street upgrading	40	60	84	840	3600	R0	R0	#VALUE!	0.002	0.000	0.000
	90	37	37	27852786	R0.00	R0.00	R0.0	Thangana Street Upgrading	0	0	137	1370	3600	R0	R0	#VALUE!	0.002	0.000	0.000
	91	38	38	27862787	R0.00	R0.00	R0.0	Maganda Street Upgrading	0	0	557	5570	3600	R0	R0	#VALUE!	0.002	0.000	0.000
	92	39	39	27872788	R0.00	R0.00	R0.0	Salamtu Street Upgrading	0	0	435	4350	3600	R0	R0	#VALUE!	0.001	0.000	0.000
	93	40	40	28012802	R0.00	R0.00	R0.0	MR 450 (centre)	0	0	621	6210	3600	R0	R0	#VALUE!	0.006	0.000	0.001
	94	41	41	28012817	R0.00	R0.00	R0.0	MR 450 (east)	610	610	6100	6100	3600	R0	R0	#VALUE!	0.007	0.000	0.001
	95	42	42	28172818	R0.00	R0.00	R0.0	MR 435	93	93	930	930	3600	R0	R0	#VALUE!	0.001	0.000	0.000